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IV. Description (illustrated by Drawings) of a Spring Level. By Mr. Donkin.

The author states that the principle of this instrument was suggested, several years since, by the sight of Hardy's Noddy. The Noddy, as is well known, consists of an adjustable weight carried by a vertical stalk, whose lower end is connected with its pedestal by a spring, forming a continuation of the stalk. When the pedestal is so placed that the stalk is vertical, if the stalk be disturbed from its vertical position the gravity of the weight tends to move it still further from its vertical position, while the elasticity of the spring tends to restore it to its vertical position. The force, therefore, which actually restores the stalk to its vertical position is the excess of the latter over the former. By sliding the weight higher on the stalk, the effect of its gravity is increased; and thus the force actually efficient in raising the stalk may be made as small as we please. The object of this adjustment, in Hardy's application of the Noddy, was to make its vibrations isochronous with those of the clock pendulum. In Mr. Donkin's application, the object is to make the restoring force as small as may be considered safe and convenient.

The instrument being in this state, suppose the pedestal to be tilted through a small angle, and consequently the bottom of the spring to be inclined through the same angle. The effect will be, that the force of the weight tends to press the stalk from its vertical position; and, therefore, as the restoring force is extremely small, it will cause the stalk to deviate through a large angle. If, then, a microscope be carried by the pedestal, in such a position that the relative motion of the stalk can be observed, that motion will give a very large measure of the inclination of the pedestal, and will, therefore, enable us to ascertain the amount of the inclination with very great accuracy. This is the principle of Mr. Donkin's instrument.

In the actual construction, the weight, instead of a ball (as in Hardy's Noddy), is a broad disk, vibrating within a box, so as to leave a very small passage for the air which is displaced by its vibration. This arrangement is made for the purpose of bringing the disk to rest in a short time. At the top of the disk is a small frame carrying a cobweb, which is observed through a roof of plate-glass with a micrometer-microscope. The metal used for the disk and spring (which are in one piece) is a composition of nickel and copper, which is found to be not magnetic.

The instrument, as first constructed by Mr. Donkin, was carried by a lever, whose end was raised by a screw with graduated head. The intention was that the screw should be turned till the cobweb, as seen in the microscope, should be brought to a determinate constant position, and that the graduations of the screw-head should measure the inclination. It appears better, however, to give up all idea of measuring by the foot-screws, and to effect the measure entirely by the micrometer of the microscope.

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After the reading of Mr. Donkin's paper, the Astronomer Royal stated to the meeting that he had carefully examined the instrument, with the view of ascertaining its delicacy, and that he had come to the conclusion that it would exhibit as minute a quantity as the Greenwich mural circles in ordinary observations.

Mr. Francis Baily presented to the Society an original portrait of Professor Schumacher, of Altona, painted by Professor Jensen.

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